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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/700,780	11/04/2003	Yasuhiro Sekiguchi	501646.20002	5491

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EXAMINER

GARCIA JR, RENE

ART UNIT PAPER NUMBER

2853

DATE MAILED: 08/25/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No. 10/700,780	Applicant(s) SEKIGUCHI, YASUHIRO	
	Examiner Rene Garcia, Jr.	Art Unit 2853	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is FINAL.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☐ Claim(s) 1-18 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 04 November 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☒ All    b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |  |
|--|--|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. ____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)            |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>23 January 2004</u> . | 6) <input type="checkbox"/> Other: ____  |

## DETAILED ACTION

### *Specification*

1. Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

2. The abstract of the disclosure is objected to because undue abstract length. Correction is required. See MPEP § 608.01(b).

### *Claim Rejections - 35 USC § 102*

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1, 2, 5, 7, 8, 11, 15 and 16 are rejected under 35 U.S.C. 102(b) as being anticipated by Takahashi (US 6,099,103).

**Takahashi disclose the following apparatus and method:**

\*regarding claims 1, 7 and 15, apparatus and method for ejecting droplets (col. 1, line 10) comprising:

\*plurality of nozzles/618/ (col. 1, line 46) through which droplets are ejected (col. 2, line 29)

\*plurality of liquid containing chambers/**ink chambers, 613/** (col. 1, line 47) each connected at one longitudinal end thereof with a corresponding nozzle/**618/** (col. 1, line 46; figs. 8a, 8b & 9)

\*actuator/**actuator wall, 603/** (col. 1, line 59) that changes a volume of each of the liquid containing chambers/**613/** (col. 1, lines 64-66; fig. 9 ref. 613 & 613c)

\*actuator controller/**625/** (col. 1, line 59) that controls driving of the actuator/**603/**

\*wherein: the actuator controller/**625/** applies, in accordance with a one-dot printing instruction (col. 2, line 67), to the actuator/**603/** an ejection pulse signal/**jet pulse signal A/** (col. 1, line 61) that increases the volume of the liquid containing chamber/**613/** to cause ejection of a droplet (col. 2, line 29), and subsequently an additional pulse signal/**droplet downsizing pulse B/** (col. 7, lines 49) that increases the volume of the liquid containing chamber/**613/** to pull back a part of the droplet about to be ejected (col. 12, lines 31-34)

\*pulse width of the ejection pulse signal/**jet pulse signal A/** is A times a time T required for a pressure wave to propagate in one way longitudinally through the liquid containing chamber/**613/**, where A is a positive constant less than  $1/0.2T-0.4T/$  (col. 3, line 54; col. 2, line 7-8: "one-way propagation time T of a pressure wave in the ink chamber")

\*regarding claims 2, 8 and 16, time interval between a completion of an application of the ejection pulse signal/**jet pulse signal A/** and a start of an application of the additional pulse signal/**droplet downsizing pulse B/** is B times the time T, where B is a positive constant; and a total value of the constants A and B is 1.1 to 1.5 (fig. 5: d "0.3T-1.0T"; with signal A being between 0.2T-0.4T in combination with delay [d])

\*regarding claims 5 and 11, each of the liquid containing chambers/**ink chamber, 613/** (col. 1, line 47) includes a pressure chamber connected at one longitudinal end thereof with a corresponding nozzle/**618/** (col. 1, line 46) and at the other end thereof with a ink supply source, a volume of the pressure chamber being changed by the actuator/**actuator wall, 603/** (col. 1, line 59) (fig. 8b)

\*wherein the liquid containing chamber/**613/** is a space from an end portion of the ink supply source on the pressure chamber side, through the pressure chamber, to the nozzle (col. 1, line 47-49)

\*further regarding claim 7, actuator control device/**625/** (col. 1, line 59)

***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 3, 9 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takahashi (US 6,099,103).

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**Takahashi disclose the following claimed limitations with respect to claims 3, 9 and 17:**

\*pulse width of the additional pulse signal is C times the time T (fig. 5;  $W_b 0.3T-1.0T$ )

**Takahashi does not disclose the following:**

Range of the pulse width is within  $0.4T$  to  $0.5T$ .

It would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize a pulse width range of  $0.4T$  to  $0.5T$ , for the purpose of reduction in size of the ejected ink droplet and obtain good print results. It has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. **In re Aller, 105 USPQ 233. Range**

7. Claims 4, 10 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takahashi (US 6,099,103) in view of Okuda et al. (6,705,696).

**Takahashi disclose all the claimed limitations except the following:**

\*regarding claims 4, 10 and 18, time T is 5 .mu.sec or less

**Okuda et al. disclose the following:**

\*regarding claim 4, 10 and 18, time T is 5 .mu.sec or less (col. 3, lines 59-63; T/pressure wave/)

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to utilize a time T of 5 microseconds or less as taught by Okuda et al. into Takahashi for the purpose of performing a minute-drop ejection (col. 1, line 59).

8. Claims 6 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takahashi (US 6,099,103) in view of Takahashi et al. (US PGPUB 2001/0043241).

**Takahashi disclose the following claimed limitations:**

\*regarding claims 6 and 12, actuator controller/625/ (col. 1, line 59) stores plural waveform patterns of pulse signals (col. 10, lines 26-28) being applied to the actuator/603/ in accordance with a volume of a droplet to be ejected upon a one-dot printing instruction (col. 2, line 67)

\*upon selection of a waveform pattern for a minute droplet out of the plural waveform patterns, applies the ejection pulse signal/jet pulse signal A/ and subsequently the additional pulse signal/droplet downsizing pulse B/ to the actuator/603/ (fig. 6; col. 8, lines 30-32 & col. 10, lines 16-28; pulse control circuit 186 is connected to I/O[116] which receives data from printing data receiving circuit [118], inherent feature that once a waveform has been selected it would be applied to eject drop)

**Takahashi does not disclose the following claimed limitations:**

\*regarding claims 6 and 12, selects any one of the plural waveform patterns in accordance with a gradation value of each pixel included in image data

**Takahashi et al. disclose the following:**

\*regarding claims 6 and 12, selects any one of the plural waveform patterns in accordance with a gradation value of each pixel included in image data (paragraphs 0006 & 0009; gradation is controlled by the print density which is controlled by number of ink droplets; therefore apparatus for ejecting droplets selects necessary waveforms)

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to utilize selecting any one of the plural waveform patterns in accordance with a gradation value of each pixel included in image data as taught by Takahashi et al. into Takahashi for the purpose of improved print quality.

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9. Claims 13 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takahashi (US 6,099,103) in view of Junhua (US PG PUB 2003/0085962).

**Takahashi disclose the following claimed limitations:**

\*regarding claim 13, actuator control device/**625**/ (col. 1, line 59) comprising:

\*waveform memory that stores plural waveform patterns of pulse signals that correspond to different volumes of a droplet to be ejected upon a one-dot printing instruction (col. 10, lines 24-28)

\*pulse generator that generates a pulse signal/**122**/ (fig. 6) to be applied to an actuator that changes a volume of a liquid containing chamber/**ink chambers, 613**/ (col. 1, line 47) on the basis of any one of the plural waveform patterns (col. 1, lines 64-66; fig. 9 ref. 613 & 613c; col. 10, lines 15-28)

\*wherein one of the plural waveform patterns stored in the waveform memory includes:

\*ejection pulse signal/**jet pulse signal A**/ (col. 1, line 61) that increases the volume of the liquid containing chamber/**613**/ to cause ejection of a droplet (col. 2, line 29) and has a pulse width of  $A$  times a time  $T$  required for a pressure wave to propagate in one way longitudinally through the liquid containing chamber, where  $A$  is a positive constant less than  $1/0.2T-0.4T$ / (col. 3, line 54; col. 2, line 7-8: "one-way propagation time  $T$  of a pressure wave in the ink chamber")

\*additional pulse signal/**droplet downsizing pulse B**/ (col. 7, lines 49) to be applied following the ejection pulse, the additional pulse signal increasing the volume of the liquid containing chamber to pull back a part of the droplet about to be ejected (col. 12, lines 31-34)

**Takahashi does not disclose the following claimed limitations:**



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\*regarding claim 13, print data memory that stores a gradation value of each pixel included in image data.

\*droplet volume determining portion that determines, with respect to each pixel, a volume of a droplet to be ejected from a nozzle, on the basis of the gradation value stored in the print data memory

\* waveform patterns corresponding to the volume of a droplet determined by the droplet volume determining portion

\*regarding claim 14, the pulse generator generates, when a smallest volume of a droplet is determined by the droplet volume determining portion, the ejection pulse signal and the additional pulse signal on the basis of one of the waveform patterns corresponding to the smallest volume

**Junhua disclose the following:**

\*regarding claim 13, print data memory that stores a gradation value of each pixel included in image data (paragraph 0173; first latch circuit and second latch circuit [gradation data “stored”]).

\*droplet volume determining portion that determines, with respect to each pixel, a volume of a droplet to be ejected from a nozzle, on the basis of the gradation value stored in the print data memory (paragraph 0173; gradation is represented by two bits to determine dot size, therefore a determination has been determined)

\* waveform patterns corresponding to the volume of a droplet determined by the droplet volume determining portion (paragraph 0185; decoder 45/selection data generator/)

\*regarding claim 14, the pulse generator/**signal generation circuit, 9/** (paragraph 0189) generates, when a smallest volume of a droplet is determined by the droplet volume determining portion, the ejection pulse signal and the additional pulse signal on the basis of one of the waveform patterns corresponding to the smallest volume (paragraph 0185; decoder 45/selection data generator/; paragraph 0188 – selecting pulse signal based on gradation data)

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to utilize a print data memory that stores a gradation value of each pixel included in image data; droplet volume determining portion that determines, with respect to each pixel, a volume of a droplet to be ejected from a nozzle, on the basis of the gradation value stored in the print data memory; waveform patterns corresponding to the volume of a droplet determined by the droplet volume determining portion; and the pulse generator generates, when a smallest volume of a droplet is determined by the droplet volume determining portion, the ejection pulse signal and the additional pulse signal on the basis of one of the waveform patterns corresponding to the smallest volume as taught by Junhua into Takahashi for the purposes of storing data (gradation values) for use by other control systems of the ink jet apparatus; and to select an appropriate waveform signal from memory to produce a high quality image.

### ***Conclusion***

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Takahashi (US 5,736,994) discloses a method of driving an ink-jet apparatus comprising an ink chamber filled with ink, and actuator for changing the volume of the ink chamber, and a control unit which causes a pressure wave to develop in the ink chamber by applying a first pulse signal to the actuator so as to increase the volume of the ink chamber, and

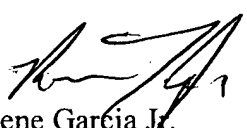
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which causes the volume of the ink chamber to be decreased from the increased state to the original state after a lapse of time T. Ishikawa (US 6,350,003) discloses an ink droplet ejecting method and apparatus, wherein, after a driving waveform for a primary ejection of ink, only one additional pulse is added, thereby making it possible to obtain an ink droplet of a desired volume.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rene Garcia, Jr. whose telephone number is (571) 272-5980. The examiner can normally be reached on M-F 8:00AM - 4:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen D. Meier can be reached on (571) 272-2149. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
Rene Garcia Jr.  
17 August 2005

 8/8/05  
K. EGGINS  
PRIMARY EXAMINER